

REMARKS

Claims 1 to 10 are pending.

Claims 6 to 10 have been withdrawn from consideration pursuant to a Restriction Requirement.

Claims 1, 3, 4 and 5 are amended.

Election/Restrictions:

In response to the Restriction Requirement under 35 U.S.C. § 121 and 372, Applicant elects claims 1 to 5 (Group I) drawn to a reinforced molded article. This election is in accordance with the provisional election made during a telephone conversation with Jack Barufka on February 12, 2003. Claims 6 to 10 are withdrawn from further consideration by the Examiner as being drawn to a non-elected invention.

Claim Rejections - 35 U.S.C. § 112:

Claims 3 and 4 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 was found to be indefinite because abbreviations were used to describe the decorative material. The claim is amended accordingly and the abbreviations are replaced with a full description of the materials.

Claim 4 was found to be indefinite because it is not clear what distinguishes a cloth from a fabric. Claim 4 is amended accordingly, and the term "cloth" is removed from the amended claim.

It is believed that the rejection of claims 3 and 4 under 35 U.S.C. § 112 is overcome by way of these amendments. Therefore, Applicant requests that the rejection of claims 3 and 4 be withdrawn.

Claim Rejections - 35 U.S.C. § 103:

Claims 1 to 3 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Okada et al. (U.S. Patent No. 4,739,007) in view of Christiani et al. (U.S. Patent No. 5,747,560).

Applicant respectfully traverses the rejection of claims 1 to 3 as being unpatentable over Okada et al. in view of Christiani et al.

Okada et al. discloses a composite material comprising a polymer matrix containing polyamide and layers of a silicate uniformly dispersed in the order of molecules in the polymer matrix, each of said silicate layers being 7 to 12 Å thick, the interlayer distance being at least 20 Å. In order to prepare such composite materials, Okada et al. teach, that it is necessary to first bring a swelling agent into contact with the clay mineral so as to exchange the cations in the interlayer space with the swelling agent and to expand the clay layers so that the swelling agent can be subsequently exchanged with a polyamide monomer. Once the polyamide monomer is introduced into the interlayer space, the mixture is heated so as to effect polymerization. The process taught by Okada et al. yields finely dispersed silicate (clay) layers in the order of magnitude of molecular dimensions (in a thickness of about 10 Å) that are firmly combined with the chains of the intercalated polymer. Okada et al. teach that a fine dispersion of the silicate layers brings about the particular advantages of their invention, see column 8, lines 1-17, and column 8, lines 27-37.

Applicant notes the Examiner's statement, with reference to column 6, lines 55-64 of Christiani et al., that Christiani et al. teach that the number of platelet particle layers are preferably less than about 5 layers in thickness, most preferably about 1 or 2 layers in thickness.

Christiani et al. teach at column 21, lines 58-66 that complete or virtually complete delamination is important for obtaining the enhanced structural properties

afforded by their invention. In particular, they expressly state that any non-completely delaminated particles have to be less than about 10 layers thick and preferably less than 5 layers thick in order for such non-completely delaminated particles to provide enhanced properties (emphasis added):

“In cases where intercalation is incomplete between some layers, those layers will not delaminate in the polymer melt, and will form platelet particles comprising those layers in a coplanar aggregate. These latter platelet particles still constitute nanoscale and nanodispersed fillers and provide enhanced properties over and above those provided by conventional micro-scale fillers, as long as they are less than about 10 layers thick and preferably less than 5 layers thick.”

Christiani et al. accordingly provide a detailed description on how to further facilitate delamination of layered materials into platelet particles and to prevent reaggregation of the particles by intercalation with swelling/compatibilizing agents. Christiani et al. state that compatibilization will lead to an improved dispersion of the platelet particles in the matrix and an improved percentage of delaminated platelets with a thickness of less than 50 Å.

The present invention teaches on page 11, lines 15-21 that the exfoliation (delamination and dispersion) of layered mineral particles into constituent layers need not be complete in order to achieve the objects of the present invention.

The exfoliation of layered mineral particles into constituent layers need not be complete in order to achieve the objects of the present invention. The present invention contemplates that more than 50% of the particles should be less than about 20 nanometers in thickness. Otherwise stated, more than about 50% of the particles should be less than about 20 platelets stacked upon one another in the thickness direction. In addition, at least 99% of the particles should have a thickness of less than about 30 layers.

Thus, claim 1 as originally filed defines that the “reinforcing particles each comprise one or more layers, at least 50% of said reinforcing particles being less than about 20 layers thick, at least 99% of said reinforcing particles being less than about 30 layers thick, and said layers comprising platelets having a thickness of between about 0.7

nm and 1.2 nm.” Amended claim 1 further recites that less than 100% of said reinforcing particles are less than 10 layers thick. This limitation is included to further distinguish the present invention from the prior art cited and of record. In contrast, Applicant submits that Christiani et al. teach that all platelet particles (i.e. 100% of the platelet particles) must be less than about 10 layers thick, preferably less than about 5 layers thick, and most preferably 1 or 2 layers thick. Thus, Applicant submits that Christiani et al. may be viewed as teaching away from the invention as defined in amended claim 1. Okada et al. teaches a uniform dispersion of silicate layers wherein the silicate layers are finely dispersed in the order of magnitude of molecular dimensions and are firmly combined with the chains of organic molecules. As stated in the Office Action, Okada et al. fails to explicitly state the exact number of layers.

However, in accordance with the present invention it is clearly disclosed that the exfoliation (delamination and dispersion) of layered mineral particles into constituent layers need not be complete in order to achieve the objects of the present invention. The present invention as defined in amended claim 1 recites that of the reinforcing particles at least 50% are less than about 20 layers thick, at least 99% are less than about 30 layers thick, and less than 100% are less than 10 layers thick. This provides advantages over the prior art because it reduces the time and cost of providing particles that are less than 10 layers thick. The present invention is more cost effective since the exfoliation of the layered mineral particles into individual layers does not need to be complete. Thus, in accordance with the present invention as defined in amended claim 1, less than 100% of the reinforcing particles are less than 10 layers thick. As explained above, in contrast, Christiani et al. teach that 100% of the platelet particles must be less than about 10 layers thick, which teaches away from the present invention as defined in amended claim 1.

Furthermore, the Office Action states that it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the teachings of Christiani et al. and form a composite material with less than about 5 layers in thickness. It is respectfully submitted, that this teaches away from the present invention as defined in amended claim 1, which recites that less than 100% of the

reinforcing particles are less than about 10 layers. Therefore, there is no motivation to provide a composite material wherein 100% of the particles are less than about 5 layers in thickness.

The Office Action further states that Okada et al. discloses that the amount of silicate layers dispersed in the polymer matrix is preferably in the range from 0.5 to 150 parts by weight per 100 parts by weight of the polymer matrix (column 3, 44-50). However, the present invention as defined in amended claim 1 recites that the reinforcing particles comprise about 2% to about 15%, by volume, of a total volume of the material. This is different from the disclosure provided by Okada et al.

Therefore, Okada et al. and Christiani et al. can actually be viewed as teaching away from the instant invention as claimed, in which it was found that exfoliation of the layered mineral particles into constituent layers does not need to be complete, as reflected by the claim-specified values. It is respectfully submitted that the combination of Okada et al. and Christiani et al. does not teach all the claim limitations, as recited in amended claim 1. In addition, Applicant submits that the Office Action has not identified any proper motivation to combine the teachings of Okada et al. and Christiani et al. to meet the claimed invention.

With regard to the protrusion limitation of claim 1, Applicant respectfully disagrees with the opinion expressed in the Office Action that embossing, as disclosed by Christiani et al. (column 24, 45-50) would produce the recited protrusions in claim 1. Claim 1 recites that the protrusion is integrally molded with said main portion and protruding from one of said surfaces, said protrusion having a thickness of less than the thickness of said main portion and less than about 0.1", said protrusion having a height of at least twice the thickness of said protrusion. Furthermore, Applicant disagrees with the statement that embossing would yield the claim-recited protrusion, and that the height and thickness limitations would be dependent on the desired end use and easily be determined by one of ordinary skill in the art. This statement dismisses the nature of the problem being solved by the present invention, as explained in the Background of the

Invention and Summary of the Invention section of the instant application. The instant application as originally filed states on page 3, lines 4-10, that conventional reinforcement fibers, such as glass fibers, inhibit substantial flow of molten material. As a result, the fibers do not align with the longitudinal direction of the protrusions, and an insufficient amount of glass fibers will enter into protrusions of thicknesses of 1/10" or less. As a result, the protrusions need to be made thicker, or otherwise not be reinforced to the desired extent. However, the instant application goes on to teach that reinforcing particles in accordance with the present invention as defined in amended claim 1 can reinforce protrusions of 1/10" or less.

For the foregoing reasons, Applicant submits that claim 1 is allowable over the applied art, and withdrawal of the rejection is respectfully requested. Claims 2 and 3 depend from claim 1 and are likewise submitted to be allowable over the applied art for at least the reasons above. Withdrawal of the rejection is respectfully requested.

Claims 4 and 5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Okada et al. (U.S. Patent No. 4,739,007) in view of Christiani et al. (U.S. Patent No. 5,747,560) as applied to claim 1, and further in view of Simm et al. (U.S. Patent No. 4,447,488).

Claims 4 and 5 ultimately depend from claim 1. Therefore, claims 4 and 5 are likewise submitted to be allowable over the prior art for at least the same reasons. Withdrawal of the rejection is respectfully requested.

Further, claim 1 is voluntarily amended to define the invention more clearly.

Claim 5 is voluntarily amended to correct a typographical error.

The Specification of the Invention is amended to make of record Governmental Support.

In view of the foregoing, it is respectfully submitted that the application is in condition for Allowance. Favorable reconsideration and prompt Allowance of the Application is earnestly solicited.

Respectfully submitted,
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